# Applying Light Physical Characteristics as One of the Visual Phenomena in Sustainable Interior Architecture

**Lect. Ahmed Fathy El-Sayed**
**Lecturer at The Faculty of Applied Arts - October 6th University**
intouch_a_fathy77@yahoo.com

## Introduction:

Light, with all its characteristics, is the main source of visual life and an important driving element within the system of life in general. It is an enchanting world that addresses the mind, the eye and the conscience. It is the music of the eyes, and a true translation of the psychological state of human beings, contributing to the formation of shapes and creating the right atmosphere for their manifestation.

Color is nothing but a visual result of light, and there have been several attempts to study and link them throughout history, as chaos dominated color science until Newton announced his new theory in 1670, which stated that "colors exist in white light itself, and what distinguishes one from others is its refractivity within the prism".

## Research problem:

- The use of industrial lighting mainly, despite the economic burden it carries and the increase in thermal loads on the building, which negatively affects the surrounding environment in terms of harmful emissions.
- The lack of use of colors in interior architecture in a consistent way with the natural environment in which it is located and the type of the facility.

### Research goal:

- Taking advantage of sustainable design standards in constructing a friendly environmental building by using sustainable natural lighting methods- solar energy- as a clean, permanent source of energy.
- Flexibility of using lighting units, reconfigure them, and change their color.

### Research importance:

Develop the interior designer's knowledge for the importance of light, its physical characteristics and its relationship with color in interior design works.

### Research limits:

Studying light physical characteristics and their role in changing the visual appearance of interior design works.

### Research Methodology:

A descriptive-analytical approach that presents the use of light physical characteristics in interior design work examples.

## Key words:

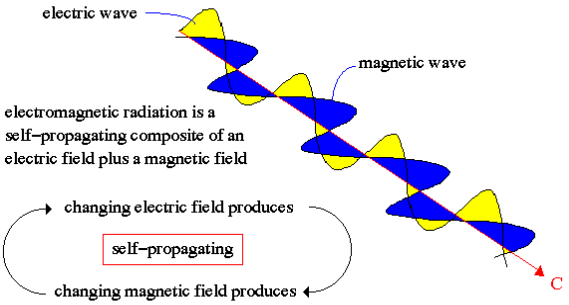
Light Physical Characteristics, Color, Interior Design, Energy Saving.

DOI: 10.21608/jsos.2021.95826.1078

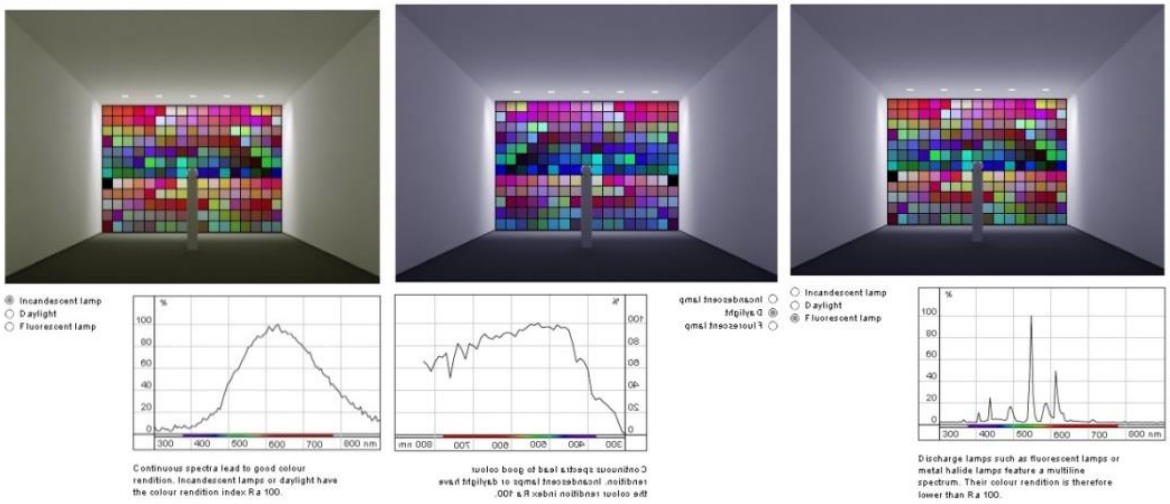
Light as one of the most important factors that ensures an appropriate performance of functions within architectural spaces. Moreover, it is one of the means of composition and artistic expressions used to enrich and create the right atmosphere to reveal the objects and highlight them clearly in human awareness. In addition, it represents a real translation of the psychological state of humans. Light is characterized by a set of properties as dispersion, refraction, interference, diffraction and diffusion, reflection, permeability, absorption and polarization.

One of the most important and difficult results associated with light is color and it is one of the most powerful design elements which enables visual communication through the sensual awareness of its physical characteristics. That's an interaction of any shape through the rays of light and color in recognition and introduction of the internal design system, regarding the mass as an outer layer. The image appears through the masses, surfaces and reflections of visual scene and thus color. Without light things are visually equal. Color is connected to light, and this is illustrated by the mass of the space. The natural and industrial visual light appears with color in the fundamentals of interior design. They represent one of the means in creating a healthy framework both functionally and aesthetically.

Therefore, the use of the physical characteristics of light and color as an artistic tool within the design elements of the mass of the space, guarantee the success of the functional side as well as the artistic and the sustainability trend within the psychological and physiological comfort.



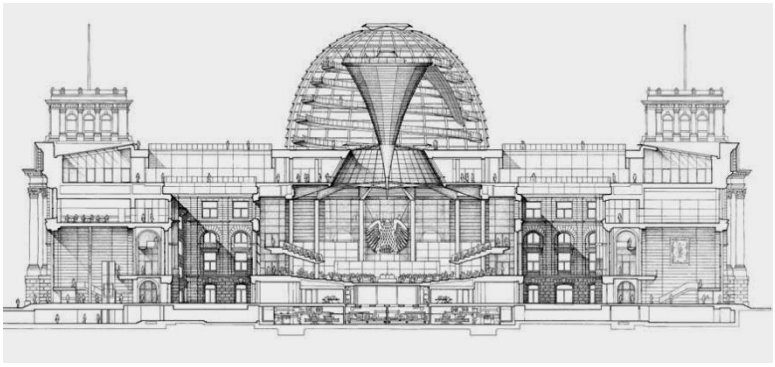

**“Light consists of magnetic and electric waves that include the visible and invisible spectrum”.**



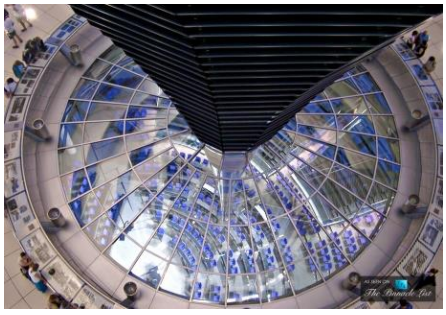

**“Whenever the ratio between the three primary light colors is absent from the percentages of their presence in white daylight, the lamp light differs from white daylight and its ability to show all known colors gets lower”.**

Present examples of facilities using technological techniques that deal with Light Physical Characteristics:

- Dome of the German parliament building- The Reichstag Dome-:

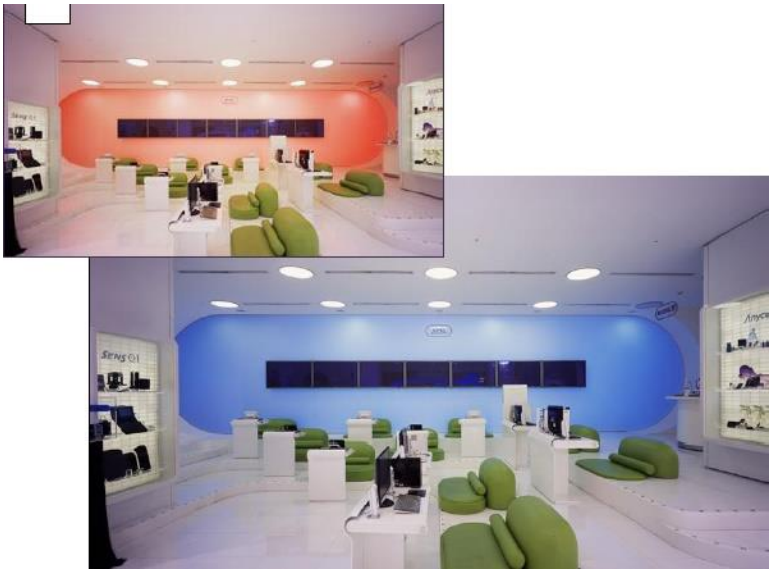


**“A vertical section of The Reichstag Dome showing the placement of the inverted cone of mirrors inside the glass dome”.**



**“The dome is a primary component in lighting and energy-saving strategies, as solar lighting is transmitted from the mirrors that cover the inverted cone inside the Parliament Hall under the glass dome”.**

- Samsung mobile phone shop:



**“The use of colored lighting to change the interior space mood contributes to change the familiar and repetitive visual form”.**

**Examples of systems that use light physical characteristics to control and change the lighting concept within the interior space:**

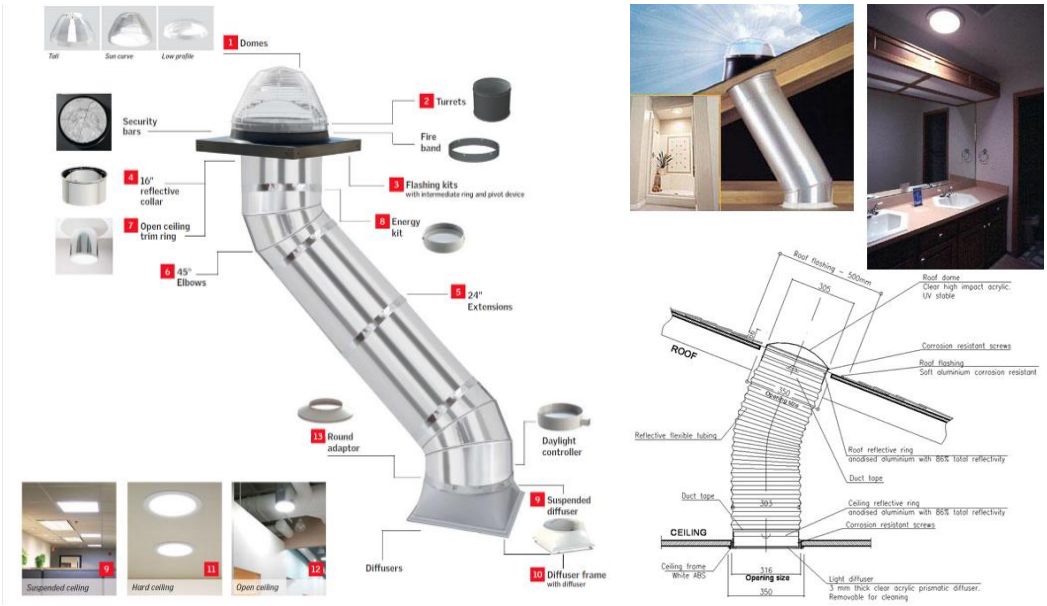
- Light-Transmitting Concrete- (LitraCon):

**"Using light-transmitting concrete in exterior facades and interior design works, showing the possibility of using colored lights on them".**

- Translucent Roof Panels (Transparent Roof Slab):


**"Transparent panels on the rooms ceiling help transmitting light and add a kind of spirituality".**

- Tubes sunlight (Sun Tunnel Skylight):




**"The installation of solar light tubes is divided into three main parts:**

**<u>The first:</u> Located on Rooftop where a mirror reflects the natural sunlight inside the tube.**

**<u>The second:</u> The tube that transmits light through its reflective inner surface.**

**<u>The third:</u> Located on the interior space ceiling where a lens helps diffuse the light into the space".**

## Research Results:

Studying light physical characteristics can provide the interior designer with alternative solutions to the traditional ones that contribute to:

**1.** Save energy and thus help the sustainability of the building.

**2.** Changing the visual plasticity of the interior spaces, which contributes to reduce the phenomenon of visual boredom and add a different and renewed vision throughout day or year.

**3.** Ensuring the success of the functional and behavioral aspects within the limits of psychological and physiological comfort.

## Research Recommendations:

**1.** The interior designer must be familiar with light physical characteristics and how to use it in interior spaces design and implementation technically and functionally in addition to achieve sustainability.

**2.** Innovative design solutions must be encouraged to contribute providing different color light solutions that may help to renew the visual appearance of the interior spaces.

**3.** There must be flexibility in lighting units to reconfigure the interior space optically to suit any necessary developments.

## References:

1. Kholosy, Mohamed Maged Abbas, AlTasmeim AlDakhely wa AlLown, 1996, Mohamed Maged Abbas Kholosy (Khas), Misr

2. Raafat, Aly, Tholatheit AlEbdaa AlMemary: AlEbdaa AlMady- Albeiaa wa Alfaragh, 2003, Markaz Abhath Enterconselt, Misr.

3. Sayed, AlSayed Aly, Faeqa Mohamed Badr (Moalef Thany), AlEdrak AlHessy AlBasary AlSamey, 2001, Maktabet AlNahda AlMasreya- AlKahera, Misr.

4. Abd ElGhaney, Khaled Mohamed, Sicologeyet AlAlwan, 2015, Moasset AlWarrak llnashr wa AlTawzeie- Aman- AlOrdon.

5. Fekry, Ahmed Ahmed, Abbas Mohamed AlZaafrany, AlZogag zo AlNafazeya AlEkhteyareya llEshaa AlShamsy- Madkhal llTasmeim AlBeiey-, Bahth Manshor, Moatamar kesm AlHandasa AlMemareya, 2006, Koleyet AlHandasa- Gameat AlKahera.

6. Mousa, Abd AlMoneim, Edaat AlMasane wa AlAbneia AlAama, 1995, Dar AlRateb AlGameeia- Beirout, Lebanon.

7. Newton, Isaac, Elias Shamoon, Resala fe AlBsareiat, 1987, Mahad AlEnmaa AlAraby- Beirout, lebnan.

**8-** Ari, Mesiel, Leed Materials- A Resource Guide to Green Building, 2010, Princeton Architectural Press- New York, USA.

**9-** Brown, Blain, Motion Picture and Video Lighting, 2012, Routledge, England.

**10-** Muhs, J.D., Earl. D., Preliminary Results on Luminaire Designs for Hybrid Solar Lighting Systems, Solar Energy-The Power to Choose, 2001, Oak Ridge National Laboratory- Washington, USA.

**11-** Thornley, Joe, Brian Fitt, Lighting Technology,2001 , Focal Press- Massachusetts, USA.

**12-** http://www.arch2o.com/transparent-solar-panels-will-turn-windows-into-green-energy-collectors